

JOAP News & Views

1st Quarter 1999

Happy New Year

New JOAP-TSC Director

Greetings! I've been on board as the Director for 3 months and am continually amazed at the level of sophistication and technical complexity associated with the Joint Oil Analysis Program. As an aircraft maintenance officer with nearly 20 years' experience, I have learned first-hand how early detection and prevention of mechanical failure of fluid-wetted components improves safety and reduces cost. We, at the JOAP-TSC, will continue to search for new and better methods and technologies to enhance our ability to analyze fluids and predict failure with greater accuracy and lead time. I look forward to working with you toward this end.

Before I close, I want to thank Commander Leonard King for his service to the Navy and the JOAP, as well as commend Mr. Randy Holland and the JOAP-TSC staff for diligently working this program while it was awaiting its new "skipper." Take a look at our web page (www.joaptsc.navy.mil) and tell us what other information you'd like to see. Our goal is to make your job easier and improve communication among the services and private sector.

LT Col John Stevens



JSF Engine Seeded Fault Test

by Gary Humphrey

The Joint Strike Fighter (JSF) seeded fault test used an F-100 engine as the platform to test the capabilities of candidate on-line sensors to detect potential failure modes. Numerous tests were performed to test the sensors: FOD was introduced, oil was thermally degraded, #1 bearing race was dimpled, gearbox was imbalanced, #1 bearing was starved of oil, SiC with ACFTD was introduced into the #1 bearing section, etc. The on-line sensors had to detect these events. The JOAP-TSC Energy Dispersive X-Ray Fluorescence Filter Debris Analysis (EDXRF-FDA) method was used as a "referee" method for the candidate sensors. The JOAP-TSC EDXRF-FDA method is not an on-line method — yet.

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FT-IR: Background - Water Vapor
Correlation & JOAP Manual Update
The Standards Corner
The EDXRF Files
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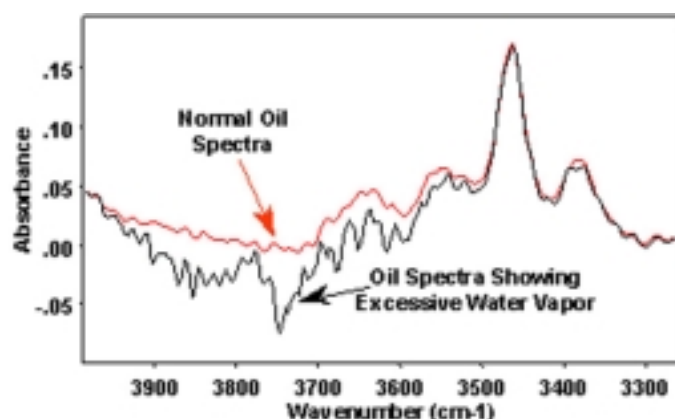
Email Address Update

JOAP email addresses have changed. All have the same format, the individuals first initial plus their last name. The extension has also changed to <joaptsc.navy.mil>. Due to government internet regulations, emails for staff members are not provided here. The JOAP-TSC general email is tsc@joaptsc.navy.mil.

FT-IR: Background - Water Vapor

by Allison Toms

A background collection (empty system reference scanned and stored on an FT-IR spectrometer) should be performed frequently enough such that ambient changes in atmospheric water vapor levels and other changing ambient conditions do not significantly affect the sample results. The frequency of background checks should be determined by the individual laboratory conditions and sampling technique, e.g., at the completion of each run when using autosamplers. Note that changing water vapor levels will have the strongest effect, as water vapor is a strong infrared absorber. The background spectrum is ratioed against every sample spectrum. This ratio removes daily variances such as carbon dioxide (CO₂), water vapor (H₂O), etc., detected throughout the entire path of the broadband infrared light source (from beam splitter, sample, cell, to detector).



The FT-IR instrument has desiccant to remove excess water vapor from the internal compartment. This desiccant requires recharging (drying) or changing approximately every six months, depending on laboratory atmospheric conditions. If you have an instrument e.g., Bio-Rad, with a rechargeable desiccant, follow the directions on the desiccant canister. Excess water vapor can damage some optical materials e.g., the beam splitter, infrared detector windows, and can impact the quality of the sample spectra. Opening the FT-IR instrument allows water vapor to enter. Only a qualified service representative should open the instrument (other than the desiccant port). After service, allow 3 to 4 hours for the water vapor to be absorbed by the desiccant. Too much water vapor present in sample spectra may cause erroneous results, particularly for water and Breakdown II in polyol esters.

A water vapor check has been added to the Bio-Rad software to monitor the intensity of the water vapor in the background spectrum. Baseline points at 1609 to 1582 cm⁻¹ are taken and the depths of the peaks at 1540, 1559 and 1652 cm⁻¹ relative to the average baseline are measured. Acceptable limits for operation have been set at <0.1 Abs. The calibration function has a new line added: *Water vapor level: <xxx (Should be <0.1)*. In addition, the left baseline for water and Breakdown II in polyol esters has been modified to overcome any erroneous results due to excess water content.

Correlation Corner

by Mike Cassady

JOAP Manual Changes

The latest changes to the JOAP Manual were submitted to NADEP Cherry Point on 10 November 1998. Routine changes do take time to process, fund, and print, so it may be a few months before you receive them. Current changes that you should have on hand include:

- | | |
|------------|---|
| Volume I | basic and changes 1, 2, and 3;
RAC 1 and IRAC 2. |
| Volume II | basic and changes 1, 2, 3, 4, and 5. |
| Volume III | basic and changes 1, 2, and 3;
RAC's 11, 13, 14, and 16;
IRAC's 17, 18, 19, 20, and 21. |
| Volume IV | basic and changes 1, 2, 3, 4, and 5. |

We hope to have the JOAP Manual on CD and possibly the Internet by 1 October 1999.

JOAP Electrode Testing

Several laboratories are reporting iron (Fe) contamination in their disc electrodes. One lot that has been reported quite often is 0897, batch 932, manufactured by Bay Carbon, Inc. If you experience any problems with electrodes, please contact Mike Cassady at the JOAP-TSC. We are tracking suspected lots and advising laboratory personnel on what paperwork to submit and who to contact about problems. This summer, the JOAP-TSC began testing all rod and disc batches that will be issued in field laboratories. Previously, the manufacturer, not the US government, performed much of the testing. We hope additional testing by the JOAP-TSC will uncover any problems, thereby ensuring a quality product is available for all JOAP laboratories.

Correlation Data Submission

We always recommend that you submit monthly correlation data by at least two methods. Data can be sent by message, facsimile, e-mail, or mail. Many laboratory personnel have chosen e-mail as their primary mode of submitting data and this method has worked quite well for everyone. We prefer that your data be submitted directly in your e-mail and not as an attachment. Please submit correlation data via e-mail to corr@joaptsc.navy.mil.

If you have a topic you would like discussed or wish to submit an article, please contact the newsletter editor.

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Standards Corner

by Marilyn Squalls

Expiration Date of Standards

JOAP standards have a definite shelf life. This shelf life *cannot* be extended. When the expiration date is reached, *dispose* of the standard in accordance with local disposal procedures. As a reminder, the shelf life for each type of standard is:

- D12 standards - 30 months
- D3 -100 standard - 12 months
- D19-0 standard - indefinite.

Please note, the following standards have expired:

<u>Concentration</u>	<u>Batch Number</u>
D12-5	Numbers below MB12-55
D12-10	Numbers below MB12-139
D12-30	Numbers below MB12-102
D12-50	Numbers below MB12-75
D12-100	Numbers below MB12-249*
D12-300	Numbers below MB12-33
D3-100	Numbers below MB-143

* D12-100 standards with batch numbers 238-248 have been recalled and should have been replaced.

As always, standards should be vigorously shaken before use to ensure that no elements have settled out. Shaking is particularly relevant when a standard has been sitting for an extended period of time, e.g., it hasn't been touched for 3 months or it is very close to its expiration date.

Pre-cut Tips

You may have noticed that the tips on some of your JOAP standard bottles are pre-cut. Please, do not think that someone has tampered with your standards. The caps were received this way from the company. The caps have red covers. The JOAP-TSC tested these caps for leakage and we have monitored the standards for potential contamination. So far, nothing unusual has occurred. If you experience any leakage or other problems, please contact the JOAP-TSC.

JSF Seeded Fault Test [Continued from Page 1]

The JOAP-TSC EDXRF method detected the imbalance in the engine gearbox by a substantial increase in Al. Bearing wear was seen by the generation of Fe and V. When SiC was mixed with ACFTD and introduced into the system, the EDXRF-FDA method saw a tremendous rise in the mass of wear metal being generated in the #1 bearing area. A representative from Lockheed suggested that after the JSF is fielded, the EDXRF-FDA method would be useful to ensure any in-line sensors are reliably performing their function. The JOAP-TSC EDXRF-FDA method will also be a referee method for the second SFET scheduled for February, 1999.

The EDXRF Files #3

by Gary Humphrey

In our last installment, we introduced the concept of particle generation during machine operation. JOAP currently utilizes the trustworthy rotrode Atomic Emission Spectroscopy (AES) to measure metallic wear in lubricating oils. However, the size of the particles that can be analyzed by AES is limited to about 10 microns. Particles larger than 10 microns can not be measured reliably. Has something gone wrong with AES?! Not at all! JOAP understands the limitations of AES and current wear metal tables are based upon oil analysis from equipment fitted with filters larger than 10 microns. So, what's the fuss? Enter the era of gas turbine engines fitted with fine filtration. Fine filtration generally refers to systems equipped with 3 micron absolute filters. Fine filtration virtually removes all particles larger than 3 microns. AES has no large wear particles to detect and thus has no chance of detecting abnormal wear under these conditions.

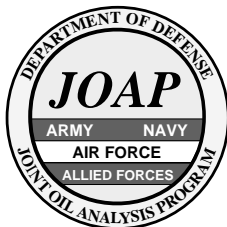
In addition to fine filtration, engines operating at higher temperatures can carbonize the oil. As the oil circulates through the system, the carbon particles are caught by the filter. As the carbon particles close the pores of the filter, even standard 5 to 10 micron filter's can take on the characteristics of a fine filter. The combination of fine filters and oil coking has rendered the thrustworthy AES ineffective for some weapons systems, resulting in the removal of some engines from JOAP AES surveillance. Our first line of defense against wear induced in-flight engine failure (for fine filtered systems) is being put out to pasture. We need a suitable replacement by an instrument method that is unaffected by fine filtration--EDXRF.

That is all for now. More in the next issue....

Particle Counter Correlation Program

by Allan Lang

The correlation program for particle counters kicked off on 2 Dec 1998 as planned. Two 175 ml samples of MIL-H-83282 and test instructions (IAW NAVAIR 17-15-521, Operations Manual for the HIAC 8011-3 Particle Counter) were sent to the 38 participating sites with a "results due date" of 4 Jan 1999. Most sites reported in the allotted time with AD1 Fuchs and AD1 David of the USS KITTY HAWK being the first--replying by 7 Dec 1998, just 5 days after we mailed the samples! Way to go guys! We're working on reported problems such as leaking bottles, incorrect addresses, etc. The majority of participants are Navy; however, the program also includes US Army Petroleum Center, New Cumberland, PA; San Antonio Air Logistics Center, TX; Oklahoma City ALC, OK; and AF Aerospace Fuels Lab, Searsport, Maine. We are looking for more sites to participate! If you are interested and have a particle counter, please contact Allan Lang at the JOAP-TSC.



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OFFICIAL BUSINESS ONLY

The Back Page

by Allison Toms

Proposed ASTM FT-IR Standard

The draft of a "Standard Practice for Condition Monitoring of Used Lubricants using Fourier Transform Infrared (FT-IR) Spectroscopy" was submitted to ASTM in December 1998 for the next E13.03 ballot. The draft was also simultaneously submitted to D2, subcommittee B, for comment. If you are on either of these committees, you should be receiving the draft. If anyone would like a copy, please email Allison Toms.

JOAP International Condition Monitoring Conference

The next JOAP International Condition Monitoring Conference will be held in Mobile, 3 to 6 April 2000. The conference is held every two years. A "Call for Papers" will be available this spring. We have had quite a few calls for information about the conference already and you can request information through <conference@joaptsc.navy.mil>.

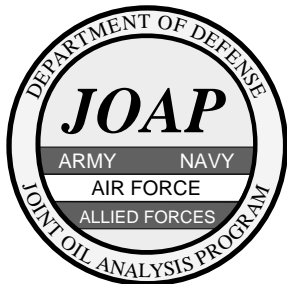
Other Upcoming Meetings of Interest to the Condition Monitoring Community (Spring '99):

Condition Monitoring '99 - April 12 - 16, 1999, Swansea, UK. Contact Mervin Jones, email: m.h.jones@swansea.ac.uk

MFPT - April 19 - 22, 1999, Virginia Beach, VA. Contact Henry Pusey, 703-754-2234, www.mfpt.org

Society of Lubrication Engineers - May 23 - 27, 1999, Las Vegas, NV. Contact STLE@interaccess.com or 847-825-5536

COMADEM '99 - July 5- 9, 1999, Sunderland, UK. Contact M. Hindmarch, 44-191-5153296, www.comadem99.sunderland.ac.uk



Answers to Crossword in 4th Quarter '98

Across:

1. CFAS
3. Spectrum
7. Element
10. Spectroscopy
12. Oil
14. Additive
15. Junior

Down:

2. Standardize
4. Electrodes
5. Viscosity
6. Correlation
8. Graphite
9. Synthetic
11. Standard
13. MOA